lectures for 1909, on the history and economics of agriculture, on May 10 and 11, at 5 p.m., in the University Chemical Laboratory, Pembroke Street. The lectures will deal largely with the sources of the cereal supply and with the agricultural history and economic position of the Russian Empire; of British India and its varying wheat exports; with the developing areas of the Argentine Republic, both as regards wheat and meat export; and will conclude with an examination of the resources and exporting prospects of the possessions of the British Crown in Australasia and in the Dominion of Canada.

LONDON.—Offices have now been definitely assigned to the Royal Commission on University Education in London, and all communications in reference thereto should in future be addressed to the joint secretaries, 12 Queen Anne's Gate, S.W.

A course of eight lectures on the "Structure and Functions of the Central Nervous System" will be given in the Physiological Institute (University College) by Dr. W. Page May on Tuesdays at 5 p.m., beginning on Tuesday, May 11. The lectures are open to all students of the University, also to qualified medical men on presentation of their cards.

OXFORD.—Much interest has been aroused by the publication of the Chancellor's letter on "Principles and Methods of University Reform." All parties seem agreed in appreciation of the fulness and lucidity of the memorandum, and of the statesmanlike qualities shown by its author. Many of Lord Curzon's proposals will be accepted in most quarters as practicable and salutary; as to others, opinions will differ. It is too soon as yet to attempt any detailed criticism of the proposed new measures, but it is satisfactory to see that Lord Curzon fully recognises the obligation that rests on the University to take its part in extending the boundaries of science. "Oxford," he says, "should train its scholars, not merely to acquire knowledge, but to increase it." The efforts of the University should be directed towards attracting, by encouragement and rewards, men who are capable of advanced and original work. Various means are suggested by which this might be done more effectually than at present, among the most important being the establishment of a system of coordination between the university and the colleges, having for its object the adoption of a general policy of research.

THE April number of the Journal of the Association of Teachers in Technical Institutions contains the programme of the Whitsuntide meeting of the association, to be held in Liverpool from May 29 to June 2. The arrangements include a visit to the R.M.S. *Mauretania*, and one to Eaton Hall. In addition to the accounts given of matters more particularly interesting to members of the society, there are useful short articles on methods of teaching in technical classes. Under the title "The Artisan's Claim to Technical Education," Mr. W. T. Emery advocates the establishment of trade schools in all our towns, believing that they would be efficient substitutes for the dying apprenticeship system. In time they would become much more, and he hoped for legislation to "limit employment under eighteen years of age to thirty hours a week, with thirty hours' technical instruction" (*cf.* Minority Report of the Poor Law Commission).

THE recently issued administrative report of the Missouri Botanical Garden, and an announcement of Washington University concerning the Henry Shaw School of Botany, indicate that the Shaw foundation is on the eve of entering on a much increased activity. Although Henry Shaw in 1885 endowed a school of botany in Washington University, to the head of which Prof. Trelease was called from the University of Wisconsin, the provision made was practically for only a chair of botany. Four years later, on the death of Mr. Shaw, his fortune, appraised at several million dollars, passed to the care of trustees for the maintenance of his long-established and well-known garden, and for the further development of an institution of research and instruction in botany and allied sciences, the head of the school of botany being selected as its director. It is now announced that a definite step toward the development contemplated by the founder and planned by the director has been taken in the establishment of the post of plant physiologist at the garden, and the creation of a professorship of plant physiology and applied botany in the Shaw School of Botany, with provision for two research fellowships in botany. Dr. George T. Moore has been appointed to the new professorship.

OUR esteemed contemporary, *Engineering*, in a leading article of April 23 dealing with "Engineering and Mathematics," takes exception to our recent remarks upon the advantage of theoretical training to the artisan. The writer of this article says that every foreman and works manager will asseverate with no little emphasis the opinion that the best handicraftsmen amongst his apprentices are not generally to be found amongst those most constant in their attendance at technical classes. We agree that this, unfortunately, is too often the case, but cannot accept the writer's explanation that this is generally owing to lack of interest in theoretical principles on the part of apprentices. Any teacher who has had extended experience of evening classes will easily give the correct explanation by referring to the huge annual bundle of reasons for absence—almost invariably overtime on the part of his best students. Overtime costs money in wages at a higher rate, and inferior apprentices are not wanted for overtime; consequently the best are selected by the foreman or manager, who, being too often himself without theorctical training, has little sympathy for his apprentices' progress in this direction. We suggest that our contemporary should refer to those cases in which the works' authorities give full facilities, without compulsion, for attendance at classes, when the opinion expressed will be probably modified.

WE have received the first volume of the report of the United States Commissioner of Education, dealing with the year ended June 30, 1908. The greater part of the work (nearly 400 pages) is occupied by statistics, accompanied by running commentary. Recent progress is reviewed, not only in the United States, Porto Rico, and the Philippines, but also in the United Kingdom, in Europe, and in Spanish-American countries. We learn that the Bureau of Education has re-organised its library so as to render this collection of 150,000 educational publications available for direct service to the institutions of the country. From the commissioner's introduction we gather that the marked features of the year were the State Educational Commissions now working in ten States, the rigour of voluntary organisations, and the general effort to "standardise" American education. This is described as "the pure-food movement in our spiritual world, necessary to the soundness of our educational freedom and experimentation." International congresses were remarkably numerous last year, and the commissioner regards as the main movement in England, France, and Germany the gradual integration of the educational system. As specially characteristic of British cities, he notes the completeness with which the entire child population is brought under control, and the provision made for promoting the physical well-being of the children. He notes the growing agencies for assisting children in their search for work when their school life is ended. He considers London to be far inferior to New York in the extent of its *public* provision for education beyond the elementary stage. Whereas in the States the disposition is to open higher education freely to all children, the effort in England is to discover and encourage special ability.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, December 10, 1908.—"Electrolytes and Colloids. The Physical State of Gluten." By Prof. T. B. **Wood** and W. B. **Hardy**, F.R.S.

Gluten is the chief protein of wheat flour. In presence of water and salts it forms a tenacious, stringy substance, which confers upon dough its characteristic physical properties. Like other colloids, the physical state of gluten is determined by the electrolytes which are present. If the salts be washed away with ordinary distilled

water, gluten gradually loses its coherence, and disperses as a cloudy, colloidal solution or hydrosol, which is precipitated by a trace of salt or alkali. The change is due, not to the water, but to the carbonic acid which is present. In the absence of salts cohesion is destroyed by traces of acid or alkali. With low salt content 0·0001 normal acid, for instance, disperses the protein almost instantaneously. Strong acids, however, disperse gluten only when their concentration is low. Above a certain critical value, *e.g.* 0·05 normal HCl, the acid restores and maintains cohesion. Alkalies act in the same way.

A hydrosol of gluten is precipitated by salt, and the gluten restored to its characteristic stringy state. There is, therefore, an antagonism between salts and acids or alkalies.

The relations between acids and salts were investigated by varying the concentration of acid and determining the concentration of salt necessary to maintain cohesion, *i.e.* to oppose completely the dispersive power of the acid. The results show that at first, as the concentration of acid increases, the concentration of salt must be increased also until a point is reached beyond which further addition of acid lessens the quantity of salt which is needed to preserve cohesion.

We may conclude from this that the dispersive action of acid increases with increasing concentration to a maximum beyond which it decreases to zero. A weak acid, such as lactic acid, will not maintain cohesion at any concentration.

Very dilute acid or alkali breaks up coherent gluten by forming round each protein particle a double electric layer. The protein may be looked upon as an amphoteric electrolyte similar to an amino-acid. It reacts with acids or alkalies to form salts of a peculiar nature, which, by ionisation, form double electric layers. Excess acid or alkali suppresses the feeble ionisation, and so restores cohesion.

The potential difference between protein and fluid was determined by measurements of the migration of the protein in unit field. It was found to increase with increase in the concentration of a strong acid up to a maximum, beyond which it diminishes. The curve expressing the relation of concentration of acid to the potential difference has the same form as that which expresses the effect of a salt upon the dispersive power of acid. Salts act by preventing the formation of electric double layers.

April 29.—Sir Archibald Geikie, K.C.B., president, in the chair.—Note on the results of cooling certain hydrated platin-cyanides in liquid air: J. Emerson **Reynolds.** Some months ago Sir James Dewar directed the writer's attention to the fact that a colourless crystalline material, which was supposed to be lithium platino-cyanide, became temporarily *red* when cooled in liquid air. On repeating the experiment with some of the material which Sir James Dewar had placed in the writer's hands for examination, he found that, after several repetitions of the treatment, a permanent yellow substance was also formed, which did not return to the usual colourless condition at ordinary temperatures. Chemical examination of the material led to the conclusion that it was a mixture of lithium chloride, cyanide, and sulphate, including merely a trace of platino-cyanide, but that rather less than 5 per cent. of *lithium platinicyanide* was present, and that the colour changes at low temperatures were due to the presence of the latter salt. Pure lithium platino-cyanide was freshly prepared for comparison, and when analysed was found to consist of $Li_2Pt(CN)_4,5H_2O$. The grass-green crystals of this salt did not become red when immersed in liquid air, but merely became paler in tint, therefore that salt could not be concerned in the production of the phenomena noted above. On the other hand, pure lithium platinicyanide, when fully hydrated, was shown by analysis to have the composition

$$Li_2Pt(CN)_5,3H_2O.$$

When the nearly colourless crystals of this compound were slowly cooled in liquid air they became of an intense *red* colour, and this change was found to coincide with the loss of one molecule of water of crystallisation, which was resumed when the temperature was allowed to rise, the colourless tri-hydrate being reproduced. Further, on *rapid* cooling of the tri-hydrate, a portion always passed beyond the red stage, and more or less of a *yellow* substance was formed. This turned out to be a yellow mono-hydrate. This hydrate also resumes water at ordinary temperatures, and affords the colourless tri-hydrate; but it was found that when certain neutral salts are present, as in the case of Sir J. Dewar's material, this re-hydration is inhibited, and the yellow mono-hydrate persists at higher temperature—hence all the phenomena noted at the outset were explained. Similar changes of colour and composition can be effected by heating the platinicyanide, but this appears to be the first case in which successive stages of dehydration of a crystallised salt have been traced on cooling the substance in liquid air.—A phenomenon connected with the discharge of electricity from pointed conductors; with a note by John Zeleny: H. T. **Barnes** and A. N. **Shaw.** In the study of point discharge made by Prof. John Zeleny, it was noticed that, when examined under the microscope, steel needle points, after discharging as anode, showed an irregular deposit, which extended outwards some little distance, and resembled ordinary rust. A much smaller deposit was noticed when the point was made the kathode. The authors have investigated, somewhat in detail, the character of this deposit, not only for steel points, but also for points of other metals. Using a microscope of high power, it was possible to distinguish characteristic forms of the deposit. These the authors classify as (1) a granular deposit; (2) a tubular deposit; (3) a smooth formation; and (4) a thin film formation. The four types are all probably connected with each other, but in appearance they are quite distinct. The tubular formation is perhaps the most interesting, and appears to be a tube of oxide growing up around a minute droplet of water, or, perhaps, hydrogen peroxide. These tubes were seen to elongate under the microscope when blown upon by moist air, and to swell up at the end as though water vapour were condensing through the thin film of oxide closing the tube. In some cases the swelling caused the oxide film to burst. In dry air the liquid appeared to recede in the tube, leaving a hard, horny structure of oxide extended. The granular deposit appeared to be broken down tubes, while the smooth formation appeared to be drops of liquid with oxide so hardened as to be incapable of extension. The thin film formation was produced only on metals less easily oxidised. The appearance of water drops on the point makes it seem probable that it is the water vapour in the discharge chamber which has condensed around the negative ions and been swept into the anode point. Discharging in absolutely dry air gave no sign of any deposit on even the most easily oxidised metals. The slightest trace of moisture in the chamber caused a growth of deposit as much as 50 per cent. of the total amount obtained when discharging in steam. The metals giving the greatest deposit were aluminium, zinc, steel, and cadmium, while gold was found to give no deposit at all. Prof. Zeleny points out that the presence of water droplets on the point indicates a much lower temperature there than the luminosity might lead us to expect. This he verifies by making a point out of the junction of two dissimilar metals.—The effect of temperature on ionisation: J. A. **Crowther.** The effect of temperature on the ionisation produced in a gas by Röntgen rays was first investigated by Perrin, who, using air, concluded that the total ionisation in a gas was independent of the temperature if the pressure were kept constant. McClung, however, who repeated these experiments later with air, carbon dioxide, and hydrogen, found that the ionisation in a gas was independent of the temperature if the density of the gas is kept constant, that is, if it is heated at constant volume. Although no source of error could be indicated in Perrin's work, there was little doubt that the later experiments of McClung were correct, and that between the limits of his experiments (15° C. to 272° C.) and for the gases used the ionisation produced by Röntgen rays was independent of the temperature when the gas was kept at constant density. It is well known that the ionisation produced by rays of given intensity in certain gases and vapours, for example, methyl iodide, ethyl bromide, or carbon tetrachloride, is much greater than that in air or carbon dioxide. The present investigation was made to discover

(i) if the effect of temperature on the ionisation produced in these gases and vapours were the same as for air; (ii) if cooling down air to a temperature near its condensation point produced any appreciable alteration in the ionisation produced in it by rays of given intensity. As it is almost impossible to clean out completely a vessel which has once contained organic vapours, the second experiment was performed first. The ionisation produced by Röntgen rays has been measured in air at the temperature of liquid air, and in ethyl bromide and methyl iodide, at various temperatures up to 184° C. It was found that in every case the amount of ionisation produced was independent of the temperature of the gas if the density of the gas remained constant.—The wave-making resistance of ships: a theoretical and practical analysis: T. H. **Havelock.** The usual estimates of the wave-making resistance of ships rest on a formula obtained for "two-dimensional" motion, that is, for motion confined to transverse waves of uniform height; if a is the amplitude of the waves and v their velocity, the wave-making resistance R is proportional to a^2 for deep water. Hence there arise formulæ which make R proportional to v^4, by supposing that a varies as v^2. Regarding, however, the ship as in this respect equivalent to a travelling band of pressure disturbance, a simple type of distribution leads to wave-ridges giving a formula for R in which the velocity enters in the form e^{-a/v^2}. This function is shown to have the general character of experimental curves of residuary resistance. From a consideration of the waves diverging from bow and stern, and the interference of these systems, a semi-empirical formula,

$$R = \alpha e^{-2\cdot53/9c^2} + \beta\{1 - \gamma\cos(10\cdot2/c^2)\}e^{-2\cdot53/c^2},$$

is obtained. Here R is in lbs. per ton displacement of the ship, and c is the speed-length ratio, viz. (speed in knots)/$\sqrt{}$(length of ship in feet); α, β, γ are adjustable constants, which depend upon the form of the ship. Various experimental model curves are examined, and it is shown that these can be represented very well by a formula of the above type. It is found that the constant α is small relatively; and if the comparison is limited to values of c from about 0·9 upwards, the curves can also be fitted by an alternative formula of the type

$$R = \beta\{1 - \gamma\cos(10\cdot2/c^2)\}e^{-n/c^2}.$$

The effect of finite depth of water is considered, and a modification of the formula is obtained to express this effect as far as possible. Starting from an experimental curve for deep water, curves are drawn from the formula for the transverse wave-resistance of the same model with different depths; although certain simplifications have to be made, the curves show the character of the effect, and allow an estimate of the stage at which it becomes appreciable. Finally, the question of other types of pressure distribution is discussed, and one is given in illustration of the wave-making resistance of an entirely submerged vessel.—The ionisation of various gases by secondary γ rays: R. D. **Kleeman.** The ionisations of a number of gases relative to the ionisation of air by the secondary γ rays from substances exposed to the γ rays of radium were measured. Secondary radiators of lead, zinc, and carbon were used. It was found that the ionisations of gases the molecules of which consist of atoms of H, C, N, O, S, Cl, with the exception of H_2, are practically the same as those obtained with the primary γ rays; but the secondary rays produce a greater relative amount of ionisation than the primary in gases the molecules of which contain atoms of higher atomic weight than that of chlorine. The ionisation of H_2 is abnormal; it is smaller with the secondary rays than with the primary. The ionisations of the various gases, with the exception of H_2, obey approximately an additive law. The atomic ionisations, by means of which the ionisations in the gases can be calculated, increase more rapidly with the atomic weight with the secondary rays than with the primary.

Geological Society, April 7.—Prof. W. I. Sollas, F.R.S., president, and afterwards Mr. H. W. Monckton, vice-president, in the chair.—Overthrusts at Tintagel (north Cornwall): H. **Dewey.** In this paper the author deals with the geological structure of the Tintagel area. After brief reference to the stratigraphy north of Bodmin Moor, mention is made of the apparent difference in order of superposition of the beds near Tintagel. The several types into which the Upper Devonian rocks are divided are next described.—The Lahat "pipe": a description of a tin-ore deposit in Perak (Federated Malay States): J. B. **Scrivenor.** Large quantities of tin ore have been obtained during recent years in the Kinta district of Perak, principally from detrital deposits, but also in some cases from the limestone which forms the floor of the Kinta Valley. From 1903 until 1907 the Société des Étains de Kinta secured more than 1000 tons of dressed tin ore from a peculiar deposit which had the form of a pipe in the limestone, measuring only 7 feet by 2 feet at the surface, but widening when followed downwards. It was worked to a depth of 314 feet. The veinstone was a deep red mixture of calcite and iron oxide with some quartz, chalybite, and chalcopyrite, but no tourmaline was found in it. In this the cassiterite occurred in irregular pieces and broken fragments, some of which consisted of radiating needles. In Kinta the tin ores occur in the limestone in two different ways:—(1) As lodes or veins with fresh sulphides, but not iron oxides. The tin-oxide crystals have a definite arrangement. (2) As transformed masses, deposited in fissures. The cassiterite is in rounded grains, and quartz, tourmaline, and other materials, also well rounded, accompany it. The Lahat pipe is a lode deposit which has been converted into a detrital deposit *in situ*.—The sculptures of the Chalk Downs in Kent, Surrey, and Sussex: G. **Clinch.** The author classifies the various forms of sculpture of the Chalk Downs under three heads, namely, (1) dry valleys of simple form; (2) dry valleys of complex form; and (3) wet valleys. He directs attention to the relatively small catchment-areas of the dry valleys, and to the large number of tributary valleys found in some districts, two points which he considers have not received hitherto entirely satisfactory explanation. While accepting the view that frozen conditions in former times altered the drainage system of the Chalk, he argues that the most potent excavating force was the frost itself acting on Chalk saturated or highly charged with water. He propounds a theory to account for (1) the great size and breadth of the valleys in relation to their catchment-basins; (2) the ramifications of some of the valley systems; and (3) the remarkable fact that many dry valleys die out just before the crest of the Chalk Downs is reached.

Royal Anthropological Institute, April 20.—Prof. W. Ridgeway, president, in the chair.—The Blackfeet Indians of Montana: W. **MacClintock.** The author has an intimate acquaintance with these Indians, having been adopted as son by Mad Wolf, one of the chiefs. The Indians were shown in their great summer encampment on the plains, and views were given of many of the lodges. These are all painted with various symbols of great interest, the heavens being usually shown at the top of the lodge, and the earth at the bottom, with various sacred animals in the middle. One of the lodges was painted with a pictorial description of the owner's victories and achievements, as also was the chief's war-horse. The great feature of this summer camp was the sun ceremony, for the tribe believes that it is descended from the sun and moon, whose grandchild, the son of the morning star, was sent down to earth. A spotless woman is the chief of the festival, and on arrival at the chosen place this woman, with her attendants and priests, fasts and prays for four days, during which time the other inmates of the camp amuse themselves with mimic warfare and games. On the third day the woman proceeds to a spot already selected, and offers a meat offering of buffalo tongues. On this spot the sun tent, a simple erection of poles, is erected, and after it has been blessed by the holy woman it becomes the central point of all the subsequent ceremonies. These consist of games, acting, and the recitation of their deeds of valour by the chiefs. The ceremonies conclude by the chief priest wishing the tribe prosperity during the coming year.

Royal Meteorological Society, April 21.—Mr. H. Mollish, president, in the chair.—Percolation, evaporation, and condensation: Baldwin **Latham.** The author gave the results of the observations which he had carried out at Croydon on these subjects during the last thirty

years. Two percolation gauges were used, both of which were exactly a superficial yard in area, and contained a cubic yard of natural soil, one of chalk and the other of gravel. The average annual amount of percolation through the chalk gauge was 10·84 inches, and through the gravel gauge 10·34 inches. The average yearly rainfall was 25·46 inches. It appears that the rate of percolation is governed by the rate of rainfall, for when once the gauges have become sensitive, by being thoroughly wetted, the rate at which rain percolates depends entirely on the quantity of rain immediately falling. The evaporator used for determining the evaporation was a floating copper vessel 1 foot in diameter supported by a life-buoy ring, connected by four arms with the evaporating vessel, the whole being floated in a tank of 4 feet internal diameter containing about 3 feet depth of water. The average annual amount of evaporation by this gauge was 18·14 inches, and the average amount of condensation was 0·36 inch.—The meteorological conditions in the Philippine Islands, 1908: Rev. José **Algué.** The year 1908 was one of extraordinary meteorological conditions. Heavy floods occurred, and frequent violent cyclonic storms passed over or affected the archipelago. The author stated that out of the fourteen typhoons of extraordinary intensity which have occurred during the past twenty-nine years, five occurred in the year 1908, the most violent being those of September 23, October 13, and December 5. It seems that the part of the archipelago which is visited the most frequently by these extraordinary typhoons is the northern part of Luzon from the parallel 15° 30′ to the Batanes Islands, and from parallel 11° to 14° N.

Mathematical Society, April 22.—Sir W. D. Niven, president, in the chair.—The principles of the general theory of integral functions: F. **Tavani.**—The equations of electrodynamics and the null influence of the earth's motion on optical and electrical phenomena: H. R. **Hassé.**—Solution of a certain transcendental equation: G. N. **Watson.**—Physical applications of certain conformal transformations of a space of four dimensions and the representation of a space time point by means of a sphere: H. **Bateman.**—Some criteria for the residues of eighth and other powers: A. E. **Western.**—Discontinuities of a function of one or more real variables: Dr. W. H. **Young.**

Institution of Mining and Metallurgy, April 22.—Mr. Edgar Taylor, president, in the chair.—The valuation of mining areas on the Rand: W. Fischer **Wilkinson.** In this paper the author points out that, to calculate the most suitable rate of working for any given area, it is necessary, in the first place, to make an estimate of the probable tonnage and the value of the ore, and that then the problem is to be solved in accordance with the following elements:—capital expenditure required for a given production, the available tonnage and its value, the cost of working, and the rate of interest required. On account of the last-named element, time is the important factor, and the paper proceeds to quote instances of the bearing of this factor on the profitable working of any given property, in the correlation of profit per ton and the suitable duration of life of the mine. Incidentally, the author is in favour of attacking the rich reefs and the richest sections of the poorer reefs first, in order to give a higher grade during the early years of a mine's life.—The "wholesale" idea in gold mining: W. R. **Feldtmann.** The author of this paper is in favour of increasing reduction plant up to the practicable producing limit of a mine, his claim being that large-scale working is directly conducive to the best economic results, and that it is the maximum total net profit during the life of a mine that should be striven for rather than low costs or high profits per ton, as the case may be, one of the factors being the reduction of costs per ton and the other the grade and annual quantity of ore available, these interacting one on the other. This is illustrated by a series of diagrams, which serve to bear out the author's argument that, on a paying mine, an increase in the tonnage crushed, by additions of ore of a yield grade anything in excess of the "unit charge," will result in an increased annual and total working profit.—The computation of the present value of developed and undeveloped mines: W. H. **Goodchild.** In this paper the author deals with certain debatable points in the practice of computing the present gross value of a mining property, giving instances of the different methods of calculation adopted by various authorities, and the influence produced by the peculiar characteristics of a given mine and its state of development.

PARIS.

Academy of Sciences, April 26.—M. Emile Picard in the chair.—Invisible pathogenic micro-organisms and the physical proofs of their existence: A. **Chauveau.** The organism of ordinary vaccine is still unknown; the effects produced by inoculating with vaccine of gradually increasing dilution prove that the virulent agents are constituted by independent corpuscular elements, held in suspension in the fluid. That the virus is not of a crystalline or colloidal nature is shown by the fact that a vaccine covered with water, and allowed to diffuse, does not communicate any virulent properties to the upper layers. The invisible agents of the virulence of vaccine are regarded as being certainly living beings.—The resinous nature of the bark of Sarcocaulon of the Cape and of some Kalanchœ of Madagascar: Edouard **Heckel.**—The hydrodynamical conditions of form in fishes: Frédéric **Houssay.** A description of experiments on the loss of energy during the propulsion through water of six models of geometrical form. From the results, the form of a fish would not appear to correspond to that of minimum resistance; loss of speed would seem to correspond to a gain of stability.—The photographic determination of the colours of the stars: Oesten **Bergstrand.** A grating, with bands 1·5 mm. in width, was placed before the opening of the telescope, thus producing a series of symmetrically placed diffraction spectra at the focus. By measuring the distance between the two spectra of the first order, the effective wave-length of the light from the star in question could be determined. The results are expressed in a scale in which 0 corresponds to a mean wave-length $\lambda=419{\cdot}9\ \mu\mu$, and 12, $\lambda=449{\cdot}6\ \mu\mu$. Stars can be divided into two well-marked classes—white stars ($\lambda=420\ \mu\mu$) and yellow stars ($\lambda=440$ to $450\ \mu\mu$). The qualities of the two groups appear to be quite different, and the transition from the one to the other is sudden.—Congruences of normals and contact transformations: Jules **Drach.**—The theorem of the existence of implicit functions: W. **Stekloff.**—Critical logarithmic points: Mme. Valérie **Dienes.**—A partial differential equation of the hyperbolic type: A. **Myller.**—Hyperelliptic surfaces: M. **Chillemi.**—Stability and diffusion; the action of mass. Mechanical analogies of the laws of displacement of equilibrium: C. **Raveau.**—Polarisation by lateral diffusion: Georges **Meslin.** It is known that when a ray of light passes through a column of a transparent liquid, the light issuing perpendicular to the direction of the ray is polarised. If the liquid contains crystalline particles in suspension, the quantity of light issuing laterally is increased, but the proportion of polarised light is diminished. In the present note a singular exception is described in the case of boric acid associated with a liquid of a refractive index greater than 1·42 (that of boric acid itself). In this case, the light issuing laterally is partially polarised, with its plane of polarisation perpendicular to the plane of diffusion. Another anomaly afforded by boric acid is that liquids in which it is a constituent possess spontaneous dichroïsm.—A divergent amplifying microscope: Alphonse **Berget.** A doubly concave lens is placed between the objective and the eye-piece. The arrangement permits of an objective of longer focal length being employed for a given magnification.—The evaporation of aqueous solutions: P. **Vaillant.** The vapour pressure is determined by observing the loss of weight of the solution placed in a flat dish on a sensitive balance.—Researches on the density of acetylene: E. **Mathias.** Details of a series of observations on carefully purified acetylene. The densities of the liquid and vapour were measured at various temperatures between $-23{\cdot}75°$ and $32{\cdot}93°$. The critical temperature, measured by the method of S. Young, was found to be $37{\cdot}05°$. The values are compared with the corresponding figures for carbon dioxide.—Cuprous sulphate: A. **Recoura.** By working in an organic medium, in the

absence of water, solid cuprous sulphate, Cu_2SO_4, has been obtained in the pure state, according to the equation $Cu_2O+(CH_3)_2SO_4=Cu_2SO_4+(CH_3)_2O$. This compound is instantaneously decomposed by water, giving copper and cupric sulphate. Cuprous sulphate on oxidation gives a substance which behaves as a mixture of cupric oxide and cupric sulphate.—Researches on the magnesium derivatives of the xylyl bromides: P. **Carré.** The *ortho-* and *para*-xylyl bromides give ditolylethanes: the *meta*-compound gives some magnesium derivative, from which, by the action of trioxymethylene, metatolylethyl alcohol was obtained.—The oxidation of aromatic nitro- and nitroso-derivatives by ammonium persulphate: A. **Seyewetz** and L. **Poizat.** 2:4-Dinitrophenol and picric acid are completely oxidised by ammonium persulphate, forming carbon dioxide, hydrocyanic acid, and nitric acid.—Researches on the ketodibasic acids. α-Oxalglutaric acid and α-ketoadipic acid: H. **Gault.**—The composition of bauxite: H. **Arsandaux.**—Respiration in singers: M. **Marage.** The influence of the mode of breathing is paramount in speaking or singing.—The influence of the reaction of the medium on the activity of the maltases from maize: R. **Huerre.** Certain species of maize furnish enzymes the maximum activity of which is exerted in alkaline media; in other species the enzyme action attains a maximum in neutral or very slightly acid media.—The influence of age on the quantity and chemical distribution of the phosphorus contained in nerves: Ch. **Dhéré** and H. **Maurice.**—A metallic filter with regular interstices of variable dimensions, and reducible to ultramicroscopic magnitudes: Émile **Gobbi.** The filter consists of a nickel ribbon wound tightly in a helicoidal form, and held together with a screw. The liquid filters through the folds of the ribbon, and, according to the mode in which the ribbon is wound, can be adjusted to hold back particles of different sizes. Sterile water can be obtained by filtration through one of these filters, and the filtrates after six days' use are still sterile.—The structure of the central part of the Hautes Plaines, Algeria: A. **Joly** and L. **Joleaud.**—The periodic character of the mutability of mesonummulitic Cerithium of the Paris basin: Jean **Boussac.**—The value and the variability of barometric means: Alfred **Angot.**—The earthquake of April 23, 1909: Alfred **Angot.**

DIARY OF SOCIETIES.

THURSDAY, MAY 6.

ROYAL SOCIETY, at 4.—Election of Fellows.—At 4.30.—Reciprocal Innervation of Antagonistic Muscles. Note XIV. On Double Reciprocal Innervation: Prof. C. S. Sherrington, F.R.S.—Note on a Curious Property of Neon: Prof. J. Norman Collie, F.R.S.—The Properties of Colloidal Systems. I. The Osmotic Pressure of Congo-red and of Some Other Dyes: Dr. W. M. Bayliss, F.R.S.—The Origin and Destiny of Cholesterol in the Animal Organism. Part V. On the Inhibitory Action of the Sera of Rabbits fed on Diets containing Varying Amounts of Cholesterol on the Hæmolysis of Blood by Saponin: Miss Mary T. Fraser and J. A. Gardner.—Some Effects of Nitrogen-fixing Bacteria on the Growth of Non-leguminous Plants.—Prof. W. B. Bottomley.

LINNEAN SOCIETY, at 8.—On some Zoantheæ from Queensland and the New Hebrides: Mrs. Leonora J. Wilsmore.—The Œcological Relations of the Tiger-Beetles: Dr. V. E. Shelford.

RÖNTGEN SOCIETY, at 8.15.—An Illustrated Description of the Historical Collection of Tubes recently deposited at the Albert and Victoria Museum: Dr. G. H. Rodman.—On X-rays Produced at a Magnetically Deflected Kathode Focus: J. H. Gardiner.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—The Theory and Application of Motor Converters: H. S. Hallo.

FRIDAY, MAY 7.

ROYAL INSTITUTION, at 9.—The Campaign against Malaria: Major Ronald Ross, C.B., F.R.S.

GEOLOGISTS' ASSOCIATION, at 8.—The Lower Chalk of Lincolnshire: Rev. C. R. Bower and J. R. Farmery.

MONDAY, MAY 10.

ROYAL SOCIETY OF ARTS, at 8.—Aërial Flight: F. W. Lanchester.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—The Western Pacific: Sir Everard F. im Thurn, K.C.M.G.

TUESDAY, MAY 11.

ROYAL INSTITUTION, at 3.—Cosmogonical Questions: Prof. Svante Arrhenius.

ZOOLOGICAL SOCIETY, at 8.30.—(1) On Hitherto Unrecorded Specimens of *Equus quagga*; (2) Differentiation of the Three Species of Zebras; (3) On a Portion of a Fossil Jaw of one of the Equidæ: Prof. W. Ridgeway.—On a New Race of Deer from Sze-chuen: R. Lydekker.—The Batrachians and Reptiles of Matabeleland: E. C. Chubb.

WEDNESDAY, MAY 12.

ROYAL SOCIETY OF ARTS, at 8.—The Principles of Heredity as Applied to the Artificial Production of New Forms of Plants and Animals: Prof. A. Dendy, F.R.S.

GEOLOGICAL SOCIETY, at 8.

THURSDAY, MAY 13.

ROYAL SOCIETY, at 4.30.

ROYAL INSTITUTION, at 3.—Newfoundland: J. G. Millais.

ROYAL SOCIETY OF ARTS, at 4.30.—Some Phases of Hinduism: Krishna Gobinda Gupta.

MATHEMATICAL SOCIETY, at 5.30.—Ternary Quadratic Types: H. W. Turnbull.—The Theorem of Gauss in the Theory of Attractions: Dr. J. G. Leathem.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Economics of Medium Sized Power Stations: A Study of Comparisons between Steam, Gas and Oil Engines: A. J. J. Pfeiffer.

FRIDAY, MAY 14.

ROYAL INSTITUTION, at 9.—Solar Vortices and Magnetic Fields: Prof. G. E. Hale.

ROYAL ASTRONOMICAL SOCIETY, at 5.

PHYSICAL SOCIETY, at 8.—On a Bifilar Vibration Galvanometer: W. Duddell, F.R.S.—Effect of Temperature on the Hysteresis Loss in Iron in a Rotating Field: W. P. Fuller and H. Grace.—On a Method of Testing Photographic Shutters: A. Campbell and T. Smith.

MALACOLOGICAL SOCIETY, at 8.—Descriptions of the Animals of Two Land Shells from Perak; Skeat Expedition in the Malay Peninsula, 1899–1900: Lt.-Col. H. H. Godwin-Austen, F.R.S.—List of Mollusca from Christmas Island, Indian Ocean, and Descriptions of New Species: E. A. Smith.—Further Notes on Holocene and Recent Non-marine Mollusca from Perranzabuloe: Rev. R. Ashington Bullen.—On Non-marine Mollusca from an Early Neolithic Interment at Cuxton, Kent: A. S. Kennard.

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